

GEOGRAPHIC STRUCTURE OF MILK PRICES, 1975

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ABSTRACT

This report measures and analyzes the relationship between prices paid by dealers for milk for fluid use and the distance from Eau Claire, Wisconsin. The relationship between retail prices and distance from Eau Claire is also shown. In addition, a regression analysis indicates the relationship between retail prices and the prices paid by dealers.

Keywords: Fluid milk market, marketing margins, milk marketing, market orders, pricing, prices, market performance.

PREFACE

This study of the geographic price structure for fluid milk analyzes the situation in 1975 and changes during the past quarter century. Four earlier USDA studies dealing specifically with this subject include: "Geographic Structure of Milk Prices 1964-65" (ERS-258), by Floyd A. Lasley, Sept. 1965; "Geographic Structure of Milk Prices, 1960-61" (ERS-71), by W. T. Butz, Aug. 1962; "Geographic Structure of Milk Prices, 1957-58" (AMS-328), by L. F. Hermann and Helen V. Smith, July 1959; "Regulations Affecting the Movement and Merchandising of Milk" (MRR-98), June 1955.

These earlier reports are out of print. The price surface maps and portions of the key tables from them are included in this report so that the reader can make direct comparisons.

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SUMMARY

The effective prices dealers pay for fluid milk delivered to the plant increase with distance from the major supply areas. Retail milk prices also tend to increase with distance from the central supply areas.

In 1975, wholesale prices increased an average of 17.5 cents per 100 pounds of milk for fluid use with each 100-mile increase in distance from Eau Claire, Wisconsin. This compares with an increase per 100 miles of 18.2 cents in 1964-65, 18.7 cents in 1960-61, 21.8 cents in 1957-58, and 19.2 cents in 1953-54. This general downtrend has occurred despite recent increases in transportation costs.

Fluid milk prices have tended to increase by an almost uniform amount in the areas east of the Rockies, so that the general pattern of differences in milk prices has remained very much the same as in previous years, but at a higher price level. Even so, because of the lower initial price level, the increase in the Upper Midwest prices during the past 11 years has been proportionally greater than in the more distant markets; the 148-percent increase in the Eau Claire area was double the 76-percent increase in Southeast Florida. Thus, where the price differentials have not kept pace with actual transfer costs, milk from the Upper Midwest is more costly than local milk for Southern and Eastern buyers. In 1975, the bulk milk price in Wisconsin would have been about 75 percent of the cost of local milk for a Florida handler, whereas it would have represented only about 55 percent in the first four studies (mentioned in the Preface).

Although distance from Eau Claire was the dominant factor and explained about 77 percent of the differences in prices, the actual prices paid by dealers do deviate from the calculated price line in response to local market conditions. However, these prices paid by local dealers do not necessarily represent the price at which large volumes of milk would be available for shipment to other markets, nor the price at which dealers would be willing to absorb large volumes from other markets. Such deviation by local prices does not imply that these markets are isolated.

Since the 1964-65 study, several changes have borne directly upon the geographic alignment of prices. The most important of these changes are merger of various Federal order markets, discontinuance of local supply-demand price adjusters, adoption of the Minnesota-Wisconsin price as the basic price in all orders, and establishment of a Class I differential increasing about 15 cents per each 100 miles distance from the basing point in Wisconsin.

Retail prices to consumers increased nearly 1 cent per half-gallon with each 100-mile increase in distance from Wisconsin. Retail prices also tended to reflect differences in bulk prices, running about 5 cents per half-gallon higher for each \$1.00 more that dealers paid for 100 pounds of milk. However, local factors have greater influence at the retail than at the plant level, with retail prices varying from city to city and from store to store. Therefore, distance explains only about a third of the geographic differences in retail milk prices.

GEOGRAPHIC STRUCTURE OF MILK PRICES, 1975

by

Floyd A. Lasley

INTRODUCTION

Although the price level of milk for fluid use has doubled in the major supply area of Minnesota-Wisconsin, the pattern of geographic price differentials for the United States looks much the same as it did 11 years ago. Most of the difference in the price dealers pay for milk for fluid use in different markets east of the Rocky Mountains is explained by the distance of those markets from the major supply areas. This price-distance relationship is the main topic of this report.

PRICE SURFACES OF DEALERS' BUYING PRICES

Price contours were prepared by plotting the effective price paid by dealers for Class I milk (milk for fluid use) in local markets in 1975 (fig. 1). The lowest price-break line was \$8.74 per 100 pounds, circumscribing the base zone, the heaviest milk producing areas of Wisconsin, Minnesota, and Iowa. Generally, the low-priced area was comparable with that shown in each of four previous USDA studies (figs. 2a, 2b, 2c, 2d). However, prices in this area had more than doubled from below \$4.00, the price level that had prevailed in the earlier studies (see Preface).

Eau Claire, Wisconsin, located in this heavy producing, low-price area, is the fringe zone for supplying milk to the Chicago market and providing supplementary supplies as needed by markets as far as Florida. Therefore, Eau Claire is the traditional price base point and is maintained in this study. The 46-cent-per-hundredweight (approximately 1 cent per quart) price breaks used in previous studies are also used in this study. Generally, the equal-price lines have maintained a surprising degree of similarity throughout the series of studies from 1953 to 1975. During this time, the lowest-price zone has tended to narrow in an east-west direction and to lengthen from north to south. The next lowest price zone has been steadily shrinking. The third zone has been almost constant toward the east and south, but has expanded to the west during the past 11 years after shrinking during the period of the first three studies.

The price difference above the base zone has steadily declined toward the west and southwest. In fact, a full price zone, and in some cases two, has dropped out of this area. Moving east and southeast, there has been some smoothing of the price lines. The same number of zones remain, but there are now fewer abrupt changes and instances where zones collapse to the point of a double price-break such as was evident in the 1960-61 analysis. These were caused primarily by State orders, 1/ which generally are now more closely price-aligned with neighboring markets than was the case in 1960-61 and earlier.

1975 Equal Price Lines

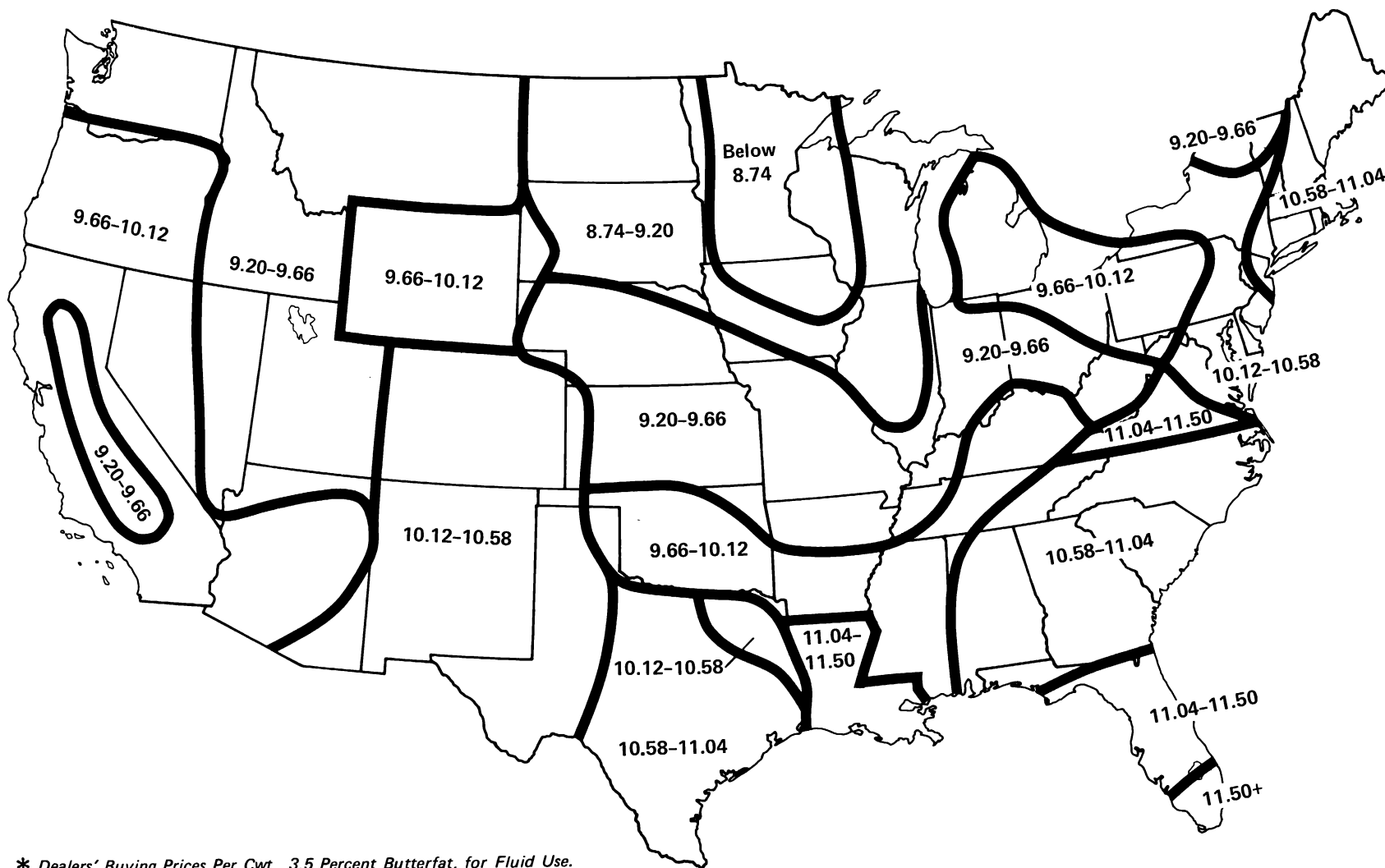


Figure 1

PRICE STRUCTURE FOR MILK*

July 1964-June 1965 Equal Price Lines

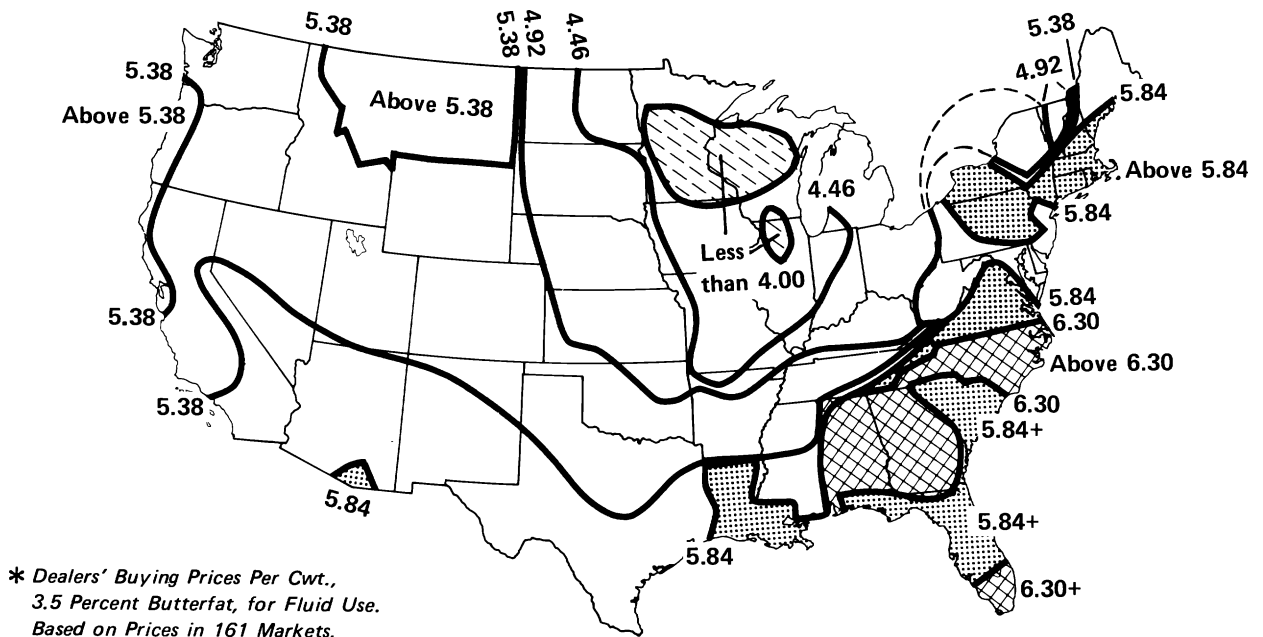


Figure 2a

PRICE STRUCTURE FOR MILK*

July 1960-June 1961 Equal Price Lines

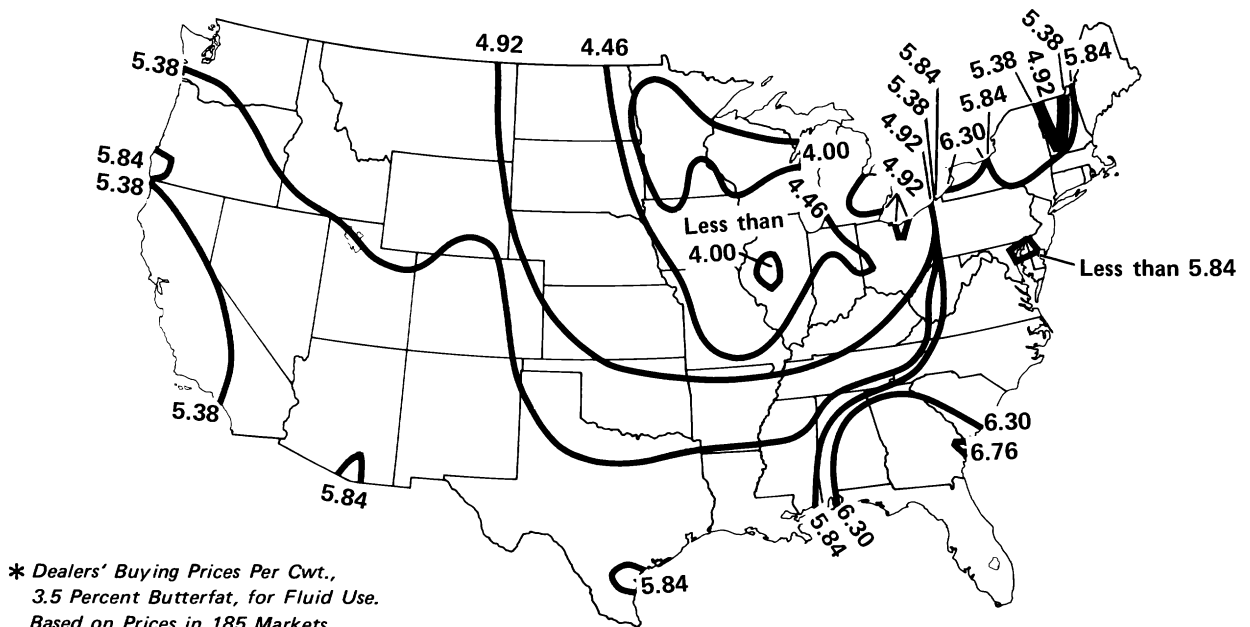
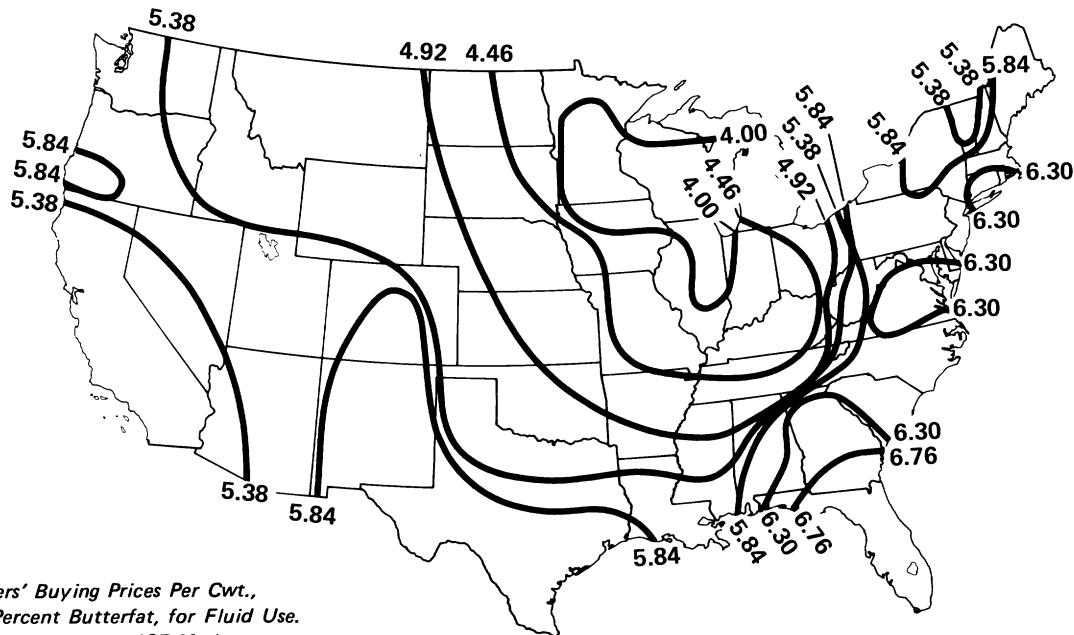


Figure 2b

PRICE STRUCTURE FOR MILK*

July 1957-June 1958 Equal Price Lines

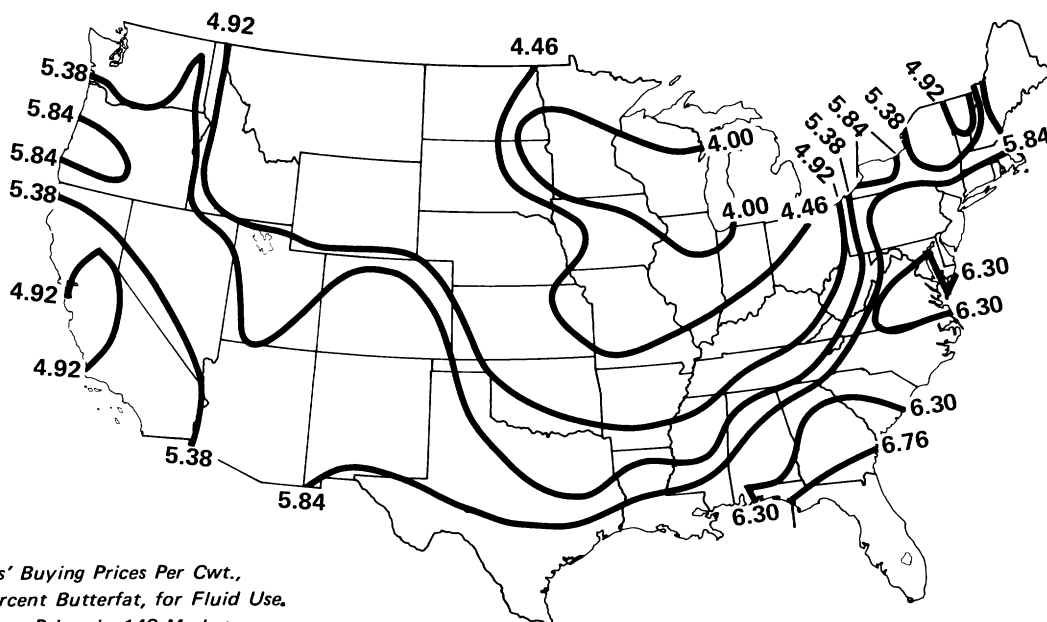


* Dealers' Buying Prices Per Cwt.,
3.5 Percent Butterfat, for Fluid Use.
Based on Prices in 185 Markets.

Figure 2c

PRICE STRUCTURE FOR MILK*

July 1953-June 1954 Equal Price Lines



* Dealers' Buying Prices Per Cwt.,
3.5 Percent Butterfat, for Fluid Use.
Based on Prices in 143 Markets.

Figure 2d

Local conditions are reflected by deviations from the general pattern. Upper Vermont and Upstate New York reported Class I prices below adjoining areas; heavy milk production in that area was the primary reason for this difference. However, dealers in part of the area buy on a flat price, paying a single price regardless of use, so that the farmer receives this price for all his milk. By designing milk procurement to meet their own needs, these local dealers are able to utilize a very high percentage of their receipts as fluid. While this area may be the most conspicuous example, some of the other apparent distortions in price lines result from comparable situations.

The prices dealers pay for milk for fluid use in the Upper Midwest have been rising relatively more than in most of the country, a fact especially evident during the rapid price increases in the last quarter of 1975. (This does not imply that this is a steady trend.) During that quarter, dealer pay prices 2/ in Montana and in the Central Valley of California were the lowest of all. These two State orders use a formula to price milk, and the formula had not kept pace with the national milk market. A comparable lag was noted for that quarter in several areas under State regulation, so that some pockets developed where prices were relatively lower than usual as compared with neighboring markets.

The price stability of State orders was not the only reason for these relative changes. Although prices rose fairly rapidly during the last half of 1975, the differential above Eau Claire price paid by the more distant dealers was not as great as usual, so the price zones widened throughout the country (see fig. 3). Moving westward from Eau Claire, there was only the one upward price-break line. Toward the southwest and south, only two general price breaks remained, with two small pockets of a higher zone. The number of price-break lines also had decreased toward the southeast, east, and northeast.

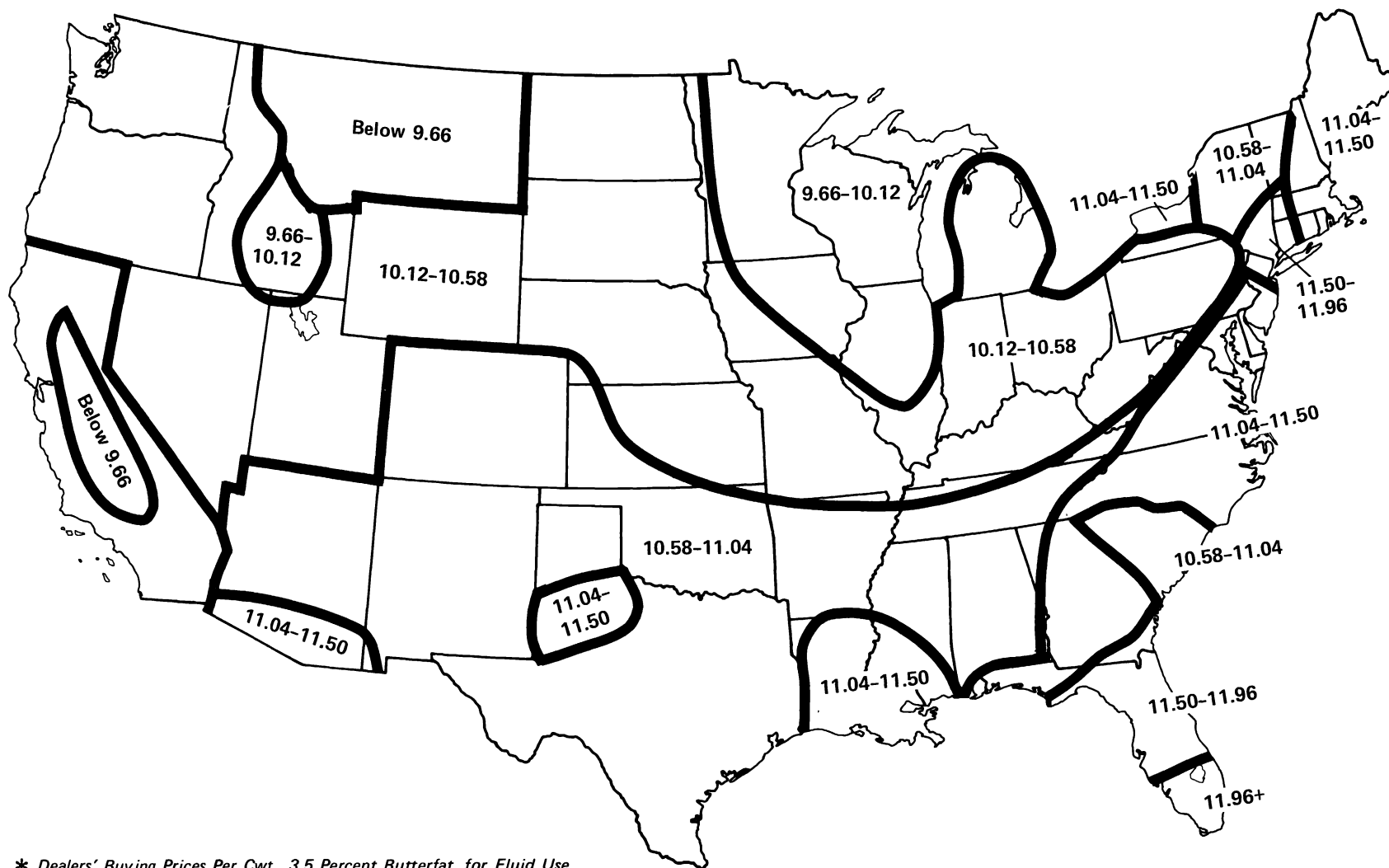
Increasing transportation factor costs (including labor, equipment, and fuel) have resulted in higher per unit transportation charges. In light of the past relationship between distance and price, this would lead one to expect the number of price breaks to increase. However, other factors overshadowed the increase in transportation charges, and, during the last quarter of 1975, the price zones had widened so that there were fewer price breaks than for any of the previous studies. This was true regardless of the direction one moved from the heavy production areas of the Upper Midwest.

1/ The Federal Milk Market Order program is administered by the Dairy Division, Agricultural Marketing Service, USDA. Federal Orders require that handlers pay producers specified minimum prices according to the use made of the milk. In 1976, 17 States were establishing their own milk prices to producers. Fifteen States were authorized to set wholesale prices, and 14 States were authorized to set retail prices for milk. Several States have trade practice laws which also influence milk prices at wholesale or retail levels. Federal Milk Orders do not set wholesale or retail prices for milk.

2/ The terms dealers' pay prices and dealers' buying prices are used interchangeably to denote wholesale prices paid by fluid processors at their plants for milk for fluid use.

PRICE STRUCTURE FOR MILK*

November 1975 Equal Price Lines



* Dealers' Buying Prices Per Cwt., 3.5 Percent Butterfat, for Fluid Use.
Based on Prices in 125 Markets.

Figure 3

Compared with all other areas, Upper Midwest dealers' pay prices for fluid use were relatively higher in this final quarter of 1975 than in any of the earlier studies. This comparison is even more dramatic if one considers the overall price for all grades of milk, as manufacturing milk prices have increased about the same absolute amount, hence proportionally more than fluid prices.

DEALERS' BUYING PRICES RELATED TO DISTANCE

The price contour maps in the previous section illustrate that dealers' pay prices for milk for fluid use increase with distance from the Upper Midwest. This section measures this tendency by using ordinary least squares regression to explain the relationship between distance and dealers' pay prices and to calculate a price trend line that depicts this relationship.

In keeping with earlier studies and with industry practice, Eau Claire, Wisconsin was used as the base point and dealers' buying prices in markets east of the Rockies were related through simple regression to highway mileage from Eau Claire. The regression equation was $y = a + bx$: Where y = computed price and x = 100 miles from Eau Claire, a = base point or intercept price, and b = increase in price per 100 miles. The trend line in figure 4 shows that dealers paid an average of 17.5 cents more per 100 pounds of milk for fluid use as distance of market from Eau Claire increased by 100 miles. Milk is shipped from several points in the Upper Midwest, some of which may be closer to the receiving market than is Eau Claire. However, adjusting the mileage by subtracting 30 to 200 miles from the distance from Eau Claire so as to measure the shortest distance between probable shipping point and receiving market did not affect the regression, so this adjustment was not included.

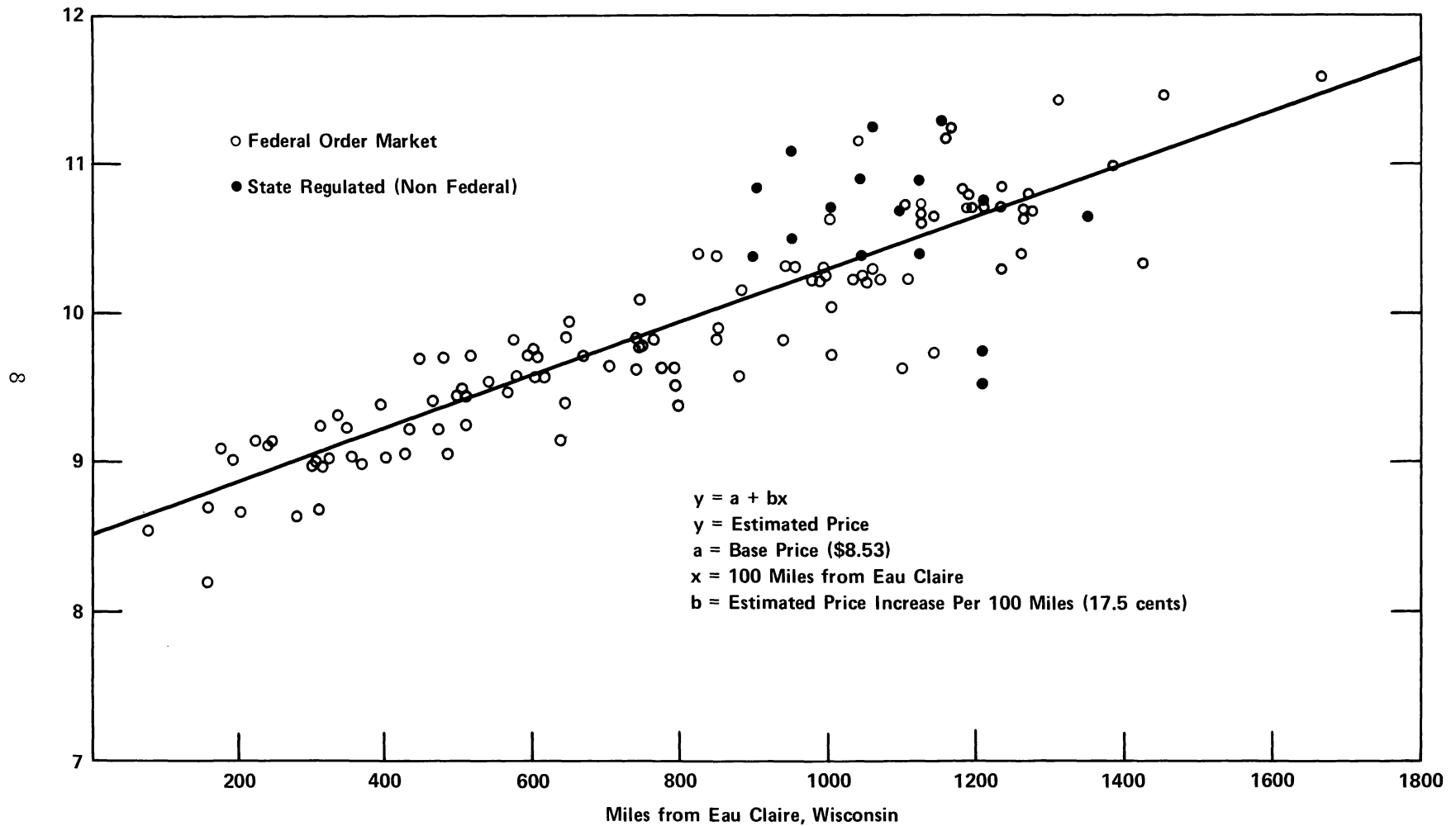
As with most farm products, milk prices generally have been relatively low in and near the heavy surplus production areas. Conversely, prices tend to decrease with distance from major consuming markets, primarily due to three factors: (1) cost of production generally tends to be higher in areas near population centers; (2) local demand pressures for fluid use in concentrated population centers are greater relative to local supply; and (3) transportation costs from alternative supply areas increase about in proportion to distance.

Markets east of the Rocky Mountains traditionally have considered the Upper Midwest supply as an alternative source of milk. Few dealers ever obtained their entire supply via shipments from the Upper Midwest area, but rather have used it as a reserve or supplementary supply, calling for extra milk when their local supply was inadequate. To the extent dealers were indifferent as to the source of milk, the cost of milk brought in either as a supplementary or alternative supply from these heavy supply areas has become a sort of norm around which local prices tend to cluster. These markets are closely interrelated and there is no implication that because local conditions do cause deviations from a calculated price line that the market is isolated.

FLUID MILK PRICES RELATED TO DISTANCE FROM WISCONSIN*

Annual Average, 1975

Dollars Per Cwt.



* Dealers' Buying Prices (125 Markets East of Rockies).

Figure 4

This study continues the same approach used in the previous four studies, whereas other investigators have recently used a somewhat different approach. 3/ 4/ Therefore, the results differ slightly in detail but not in substance from those investigations. This report is based on the weighted average effective prices in each market, while others have used the Class I prices as quoted by the producers' cooperatives. The major difference, though, lies in the number and character of markets used in relating price to distance from Eau Claire, Wisconsin. Babb and the Capper-Volstead committee both defined each Federal Order as a single market, and assigned one price to that market. This study continues to use those market centers which were formerly reported in the Fluid Milk and Cream Report (a monthly publication by Statistical Reporting Service, USDA, which was discontinued in mid-1973), including 17 cities not in a Federal Order area during 1975. This gives a much larger number of markets, with several markets in some of the larger Federal Orders.

For example, nine cities in New York State are included in this report, while the New York-New Jersey Federal Order would count seven of these as a single market, and omit the two State order markets. As a single market, the weighted average price for fluid milk would have been about 12 cents above the price predicted by the regression analysis. On the other hand, prices in the nine New York cities showed a total range of \$1.21, deviating from as much as 81 cents below the regression line to 40 cents above. 5/ These local differences, reflecting various marketing institutions, State orders, varying services performed by cooperatives, and wide variations in supply-demand pressures, increase the scatter around the regression line (fig. 4), and result in a lower explanatory value for the dominant factor--distance from Eau Claire. Some deviation arises from the relatively large size of production, shipping, and market areas, with the accompanying problem of intermarket vs. intramarket price alignment.

As in the earlier studies, the regression analysis found that about three-fourths of the variation in prevailing Class I prices was associated with distance. This similarity, in the face of rising milk prices and transportation costs, led to comparing these relationships over time. These comparisons are shown in table 1 for 108 to 132 markets east of the Rockies, and for 82 to 108 cities in Federal Order markets for selected years 1960-75. With improved transportation and accessibility of markets, the percent variation in price explained by distance (as indicated by the correlation coefficient) appeared to increase through 1972. It was low during 1974, but was up again in 1975. The relationship between price and distance was consistently higher in Federal Order markets than in all markets. There was no statistical relationship between distance and dealers' pay price in State-regulated markets as a group, primarily because there was so little variation in their distance from Eau Claire.

3/ Price relationships among Federal Milk Marketing Orders, Purdue Sta. Bul. 146, E.M. Babb, D.E. Banker, and G.L. Nelson, Nov. 1976.

4/ Report of USDA Capper-Volstead Committee, Dec. 1976.

5/ A recommended partial decision to amend the New York-New Jersey order was published in the Federal Register, Part III, April 11, 1977. This decision, based on a public hearing held in Feb. 1976, specifically addresses the joint pricing problems of intramarket and intermarket price alignment, and market sector cost differentials.

Table 1--Milk prices related to distance from Eau Claire, Wis., selected years, 1960-75, markets east of Rocky Mountains

Item	Unit	1960	1965	1967	1968	1970	1971	1972	1973	1974	1975
ALL MARKETS--DEALERS' BUYING PRICES											
Number of markets		114	108	117	132	131	128	127	126	126	125
Correlation <u>1</u> /		.76	.68	.78	.82	.84	.85	.86	.74	.61	.77
Base price	Dol/cwt	3.772	3.886	4.985	5.299	5.753	5.955	6.127	7.115	8.497	8.531
Price increase per 100 miles	Cents	20.2174	17.4549	14.8946	14.5425	14.3777	14.0725	13.5223	14.3746	17.4640	17.5315
FEDERAL ORDER MARKETS--DEALERS' BUYING PRICES											
Number of markets		104	87	92	108	108	108	106	82	107	108
Correlation <u>1</u> /		.81	.80	.79	.83	.90	.90	.89	.91	.85	.86
Base price	Dol/cwt	3.726	3.844	5.017	5.296	5.715	5.924	6.117	7.089	8.555	8.469
Price increase per 100 miles	Cents	20.6444	16.9510	14.0264	14.6431	14.9589	14.4630	13.5972	15.3739	17.7845	18.1689
FEDERAL ORDER MINIMUM CLASS I PRICES											
Number of markets		104	87	92	108	108	108	106	82	107	108
Correlation <u>1</u> /		.82	.78	.78	.86	.88	.90	.86	.88	.83	.80
Base price	Dol/cwt	3.570	3.716	4.785	4.993	5.489	5.624	5.836	6.771	8.102	8.127
Price increase per 100 miles	Cents	21.5129	17.3976	15.9581	16.0128	15.2205	15.4212	15.5063	15.4124	15.6537	15.6521

1/ Correlation is the percent of price differences explained by (associated with) distance, with 1.00 representing 100 percent or complete explanation and 0 representing no explanation.

The intercept or base price indicated by the regression was \$3.77 in 1960 and rose each period to \$8.53 in 1975, which was the same as the actual Eau Claire price in 1975. Including the earlier studies, this intercept price predicted by the regression has varied from 24 cents below to 20 cents above the price actually paid by Eau Claire dealers.

The f.o.b. plant price paid by dealers for bulk milk now represents a greater proportion, and transportation a smaller proportion, of the total cost for Eastern and Southern markets purchasing milk from the heavy surplus areas. In the first four studies, bulk milk f.o.b. the shipping plant represented about 55 percent of the total cost for a Florida handler to buy milk from Wisconsin. In 1975, the bulk milk price in Wisconsin would have been about 75 percent of the cost of local milk for a Florida handler. Cost relationships changed in a like manner for other important market areas as milk prices increased by an almost uniform absolute amount across the United States--or at least in the areas east of the Rockies, resulting in a greater relative increase in the Upper Midwest than in other areas. During the last 11 years, prices in the Eau Claire area have risen to 248 percent of their 1964-65 average--an increase of 148 percent. Prices in Southeast Florida, on the other hand, increased by 76 percent--proportionally only one-half as much as at Eau Claire.

Generally, during the periods represented by the first four USDA studies, milk from Wisconsin cost Southern processors about the same as local milk for fluid use, as the price differential was about equal to the transfer costs. However, in 1975 actual transfer costs, approximately 21 cents per 100 miles, were significantly greater than the price differential so that milk "imported" from the Upper Midwest was more costly than local milk.

If fluid grade milk is of comparable quality within the different regions and there is freedom of movement between markets, one would expect the average increase in prices with distance to approximate intermarket transfer costs. Conditions making it easier to move milk between markets should cause the actual prices to be more closely aligned with each other and with the price line estimated by relating price to distance. Factors discouraging intermarket movements would result in a pattern of prices showing considerable dispersion around the estimated line.

The straight line regression (fig. 4) explained most of the variation in prices for 1975, though all regions had markets deviating from the average regression line. However, since the 1964-65 study, several changes have caused intermarket bulk milk prices to become more closely aligned with the price line estimated by the regression. Milk markets have become more regional and less local in nature as improved transportation and keeping quality have made it practical to move milk regularly over greater distances. The primary changes that have caused closer price alignment among markets (and between the predicted and actual prices) were (1) the merger of various Federal Order markets, which consolidated previously separate markets; (2) the discontinuance of the local supply-demand adjusters which were used during the mid-1960's to adjust the individual market Class I price based on the percent of the local supply used as fluid; (3) adoption of the Minnesota-Wisconsin price as the basic price (lowest value use in manufactured products)

in all orders rather than using local hearings to establish the Class I price in each Federal Order as had been done previously; (4) setting the Class I differential (price differential above the manufacturing use price) for each Federal Order market so as to increase approximately 15 cents per hundredweight per 100 miles distance from the basing point in Wisconsin (set in 1968 and maintained at that same level); (5) continued breakdown of local restrictions to intermarket movement of milk; (6) closer alignment of prices under State orders with nearby areas; and (7) increased role of cooperatives in balancing milk supplies among handlers in multimarket areas, and manufacturing the reserve milk supplies.

As a result of these changes, dealers' buying prices have consistently been showing less extreme deviation from the calculated price line during the 23-year period covered by these comparisons (table 2). Deviations greater than 50 cents have decreased, while a greater proportion of the market prices now vary less than 25 cents from the price line estimated by regression. This pattern has been most noticeable in the three East Coast regions--New England, the Middle Atlantic, and South Atlantic. Prices in the North Central regions continued about the same degree of deviation, but markets in the eastern portion of the North Central Region have gradually been shifting from below to above the calculated line, while the Western North Central markets have tended to offset this change. South Central markets continue with about the same pattern of deviation as in the 1953-54 study, although Western South Central prices have shown some shifting toward being slightly above the calculated price line.

As expected, despite these adjustments toward alignment, the pattern of actual prices continues to be fan-shaped when plotted (fig. 4), with the greatest deviations between actual prices and the trend line occurring in distant markets where local competitive and institutional differences have a greater opportunity for expression. The Virginia State-regulated markets provided the greatest deviation on the high side and, as in the previous studies, those in Vermont provided the greatest deviation on the low side. Also, as expected, those markets significantly on the low side, regardless of distance from Eau Claire, tend to be near local supplies of milk that are relatively heavy compared with local demand. Average deviations in 28 selected markets depict relative changes during the periods of the five USDA studies (table 3).

Those markets with prices substantially above the average relationship may appear to offer an incentive to ship milk in from other markets. Similarly, those with prices below the regression line may seem to be potential sources of supplies for higher priced markets. These average relationships should be interpreted with caution, as factors other than distance from Wisconsin do affect prices in local markets. One factor which probably has been contributing a greater portion of the price variability is the type and amount of marketing services performed by cooperatives, which are included in these reported prices.

Wide differences in the supply-demand balances exist among the markets. However, as previously mentioned, most dealers attempt to follow a pricing and procurement policy which will provide them with a supply to meet most of their

Table 2--Dealers' buying prices, f.o.b. city, compared with calculated prices, selected markets east of Rocky Mountains, 1953-54, 1960-61, 1964-65, and 1975 1/

Region	: Markets in which dealers' : : buying prices exceeded : : calculated prices by-- :			: Markets in which dealers' : : buying prices were below : : calculated prices by-- :			All markets
	: Over 50 : : cents :	: 26-50 : : cents :	: 1-25 : : cents :	: 1-25 : : cents :	: 26-50 : : cents :	: Over 50 : : cents :	
				<u>Number</u>			
New England:							
1953-54		3	1		4	7	15
1960-61			4	10		2	16
1964-65			3	7		3	<u>2/</u> 14
1975			1	7		1	10
Middle Atlantic:							
1953-54	4	1	1	5	1	1	13
1960-61	7	4	3	4			18
1964-65	5	3	5	1	4		18
1975		2	5	7	1	2	17
South Atlantic:							
1953-54	11	7	2	3	2		25
1960-61	11	8	3	2	1	1	<u>2/</u> 27
1964-65	9	3	3	5	2		<u>2/</u> 23
1975	5	3	4	4	1		17
East North Central:							
1953-54			4	13	5	3	25
1960-61		5	7	18	7	1	38
1964-65		1	9	15	5		30
1975		5	14	7	1		27
West North Central:							
1953-54	2	5	7	4	2		20
1960-61		2	9	4	9	3	27
1964-65		1	8	8		3	20
1975		1	2	13	3	1	20
East South Central:							
1953-54	1	2	2	3	2	2	12
1960-61	2	1		7	4	1	15
1964-65	3		3	6	2		14
1975	2	2	3	1	2	2	12
West South Central:							
1953-54		2	1	2	4	1	10
1960-61				6	7	4	<u>2/</u> 18
1964-65		2	3	2	4	1	12
1975	3		5	4	3	1	<u>2/</u> 17
Mountain:							
1953-54	2		2				4
1960-61			1	2	1	1	5
1964-65				4		1	5
1975			3		1	1	5
Total:							
1953-54	20	20	20	30	20	14	124
1960-61	20	20	<u>2/</u> 29	53	29	13	164
1964-65	17	10	34	48	17	8	<u>2/</u> 136
1975	10	13	37	43	12	8	<u>2/</u> 125

1/ The calculated price is derived from a regression of dealers' buying prices on distance from Eau Claire, Wis. Prices adjusted to 3.5 percent butterfat. 2/ Includes markets in which dealers' buying prices were equal to calculated price.

Table 3--Dealers' buying prices, f.o.b. city, compared with calculated prices, 28 selected markets, 1953-54, 1957-58, 1960-61, 1964-65 and 1975 1/

Region and market	Amount by which dealers' buying prices deviate from calculated price				
	1953-54	1957-58	1960-61	1964-65	1975
	:	:	:	:	:
			Dollars		
New England:					
Boston	-0.59	-0.07	-0.08	-0.07	-0.07
Burlington	-1.63	-1.34	-1.35	-1.25	-1.11
Portland	-.43	-.34	-.03	-.20	-.22
Middle Atlantic:					
Camden	-.12	.21	.17	.13	-.16
New York	.22	.47	.35	.08	.17
Philadelphia	-.09	.25	.34	.14	-.16
Pittsburgh	.83	1.14	1.18	.30	-.01
East North Central:					
Chicago	-.14	-.10	.04	-.06	.16
Cincinnati	-.05	-.01	-.05	-.11	-.01
Detroit	-.23	.10	.26	.18	.28
Indianapolis	-.15	.07	-.11	-.17	.04
Milwaukee	-.16	-.02	.17	.02	.17
West North Central:					
Des Moines	.37	.36	.17	.07	-.08
Kansas City	-.12	-.02	-.07	-.13	-.01
Minneapolis	.23	.30	.23	.10	-.12
Omaha	.22	.26	.25	.09	-.06
St. Louis	.05	-.22	-.27	-.22	-.17
South Atlantic:					
Charlotte	.32	.43	.54	.74	.83
Jacksonville	.76	.56	.50	.09	.59
Miami	-.02	-.46	-.55	-.38	.11
Richmond	.80	.66	.37	.60	.89
Savannah	.86	.61	.83	.56	.05
Washington	1.08	1.23	.28	.00	-.04
East South Central:					
Birmingham	.54	.59	.77	.83	.69
Louisville	-.14	-.27	-.22	-.17	.09
West South Central:					
Dallas	-.30	-.32	-.29	-.36	.02
New Orleans	.08	-.37	-.14	.24	.62
Mountain, Denver	.58	.51	.22	-.10	.14
Average deviations: 2/					
All 28 markets	.40	.40	.35	.26	.28
Federal markets	.19	.22	.22	.15	.17
State markets (non-Federal)	.63	.65	.64	.64	.75
Unregulated markets 3/	.54	.54	.16	.09	--

1/ The calculated price is derived from a regression of dealers' buying prices on distance from Eau Claire, Wis. All prices adjusted to 3.5 percent butterfat.

2/ Average of absolute deviations, that is, deviations without regard to sign.

3/ Includes 4 markets in 1953-54 and 1957-58, 2 in 1960-61, 1 in 1964-65, and none in 1975.

regular needs without generating undue surplus. They then depend upon supplementary supplies, obtained by their own procurement or through a supplier, to cover additional volume needed because of variations in either supply or demand. The prices reported by local markets do not indicate that they have milk available for regular shipment to other markets at those prices. Neither do they imply that these local markets would be able to absorb shipments from other markets at these prices.

RETAIL PRICE RELATIONSHIPS

Two general hypotheses were advanced concerning the geographic structure of retail prices for packaged milk: (1) retail prices are positively correlated with distance from Eau Claire, and (2) retail prices are positively correlated with the prices dealers pay for milk for fluid use. Although the correlation analysis explained only part of the geographic differences in retail prices, both hypotheses are true--retail prices are higher in the markets farther from Eau Claire, and do reflect dealer pay prices.

Retail prices for half gallons of milk sold through stores were taken from the Fluid Milk and Cream Report through mid-1973, when that publication was discontinued. Prices for later dates were obtained from several sources: the International Association of Milk Control Agencies; Bureau of Labor Statistics; Agricultural Marketing Service, USDA; State universities; and local newspaper advertisements. It was not feasible to obtain strictly comparable data, so in the interest of comparability the sources were considered in the order listed.

Retail prices vary more within a market or between adjoining markets than do prices paid by dealers for bulk milk. Both Manchester and Jones ^{6/} reported marked differences in store retail prices for milk between competing markets, between competing stores in the same market, and even within the same store. They did show that, in most instances, there was a prevailing price around which prices in a market tended to cluster. This prevailing price represents a good approximation of the price to consumers in the market.

Because of the degree of variation, a retail iso-price map as shown for dealers' pay prices would be excessively cluttered. However, expanding the prevailing price concept to larger areas, it is possible to show price surfaces with 10 cents per half-gallon price breaks for these areas (fig. 5). In general, these surfaces show a pattern of three areas with relatively low retail prices in the Upper Midwest, Northeast, and Far West. Prices do tend to increase with distance as one moves away from the heavy milk production zones in these three areas, with the highest retail prices in the extreme southern parts of the country. Using simple regression analysis to relate retail price to distance shows that even though the correlation was low, the regression coefficient was highly significant and, on the average, retail

^{6/} Pricing Milk and Dairy Products--Principles, Practices, and Problems (AER-207), Alden C. Manchester, U.S. Dept. Agr., June 1971; and Milk Sales in Foodstores: Pricing and Other Merchandising Practices (MRR-983), W. Webster Jones, U.S. Dept. Agr., Jan. 1973.

Cents Per One-Half Gallon Sold through Stores, Annual Average, 1975

Cents Per One-Half Gallon Sold through Stores, Annual Average, 1975



Figure 5

prices east of the Rockies increased a little less than 1 cent per half-gallon for each 100-mile increase in distance from Wisconsin (table 4).

The degree of variability in retail prices resulted in a low correlation between dealers' pay prices and retail prices. Although the portion of the cross-sectional retail price variation explained was low, the regression coefficient was very significant. On the average, the intermarket comparisons indicate that half-gallon retail prices tend to be about 5 cents higher for each \$1.00 more that dealers pay for 100 pounds of milk (table 5). Moreover during the period 1960-75, this relationship has been rather stable, varying on a yearly basis only from 4.1 to 5.7 cents per \$1.00 difference in pay price. Quarterly, the coefficient has varied from 2.9 cents to 6.4 cents. In effect, 4.5 cents per half-gallon just passes on the difference of \$1.00 per 100 pounds wholesale price to the retail customer.

For any geographical comparison, retail prices were more variable than were dealers' pay prices for bulk milk. Local differences have more opportunity to manifest themselves at retail where several market segments coexist even within a given city. Both the price contour map and the regression analysis show that a 46-cent-per-hundredweight (equivalent to 1-cent-per-quart) price zone tends to be 200-300 miles in width. With excellent communication, and considering the large volumes involved, procurement and supply specialists will rapidly adjust if bulk prices get out of alignment so that with distance there generally is a gradual change in the price of bulk milk. On the other hand, at the retail level, a difference of more than 1 cent per quart exists within most major urban markets.

CONCLUSIONS

The geographic pattern of price differentials for fluid milk remains much the same in 1975 as it was in 1964 and even in 1953. Price levels have increased almost uniformly, so that intermarket differences in price have been suprisingly stable--especially so when one considers the increasing cost of transportation. Supplementary supplies of milk brought in from the Upper Midwest cost more than dealers are paying for local supplies in almost all areas.

Prices paid by dealers for milk for fluid use increase with distance from Eau Claire, Wisconsin. Distance explains about three-fourths of the difference in prices east of the Rockies, while local factors are responsible for the other one-fourth.

Generally, the more distant the market from Wisconsin, the more consumers can expect to pay for milk at the store. However, local factors have greater influence at retail than at the plant level, so that only about one-third of the geographic retail price differences is explained by this distance factor. Relatively low retail milk prices are enjoyed by the Upper Midwest, the Northeast, and the Far West.

Table 4--Retail milk prices in markets east of the Rocky Mountains related to distance from Eau Claire, Wisconsin, selected years 1960-75

Item	Unit	1960	1965	1967	1968	1970	1971	1972	1973	1974	1975
FEDERAL ORDER MARKETS											
Number of markets		91	95	88	105	107	110	106	82	81	86
Correlation $\frac{1}{\text{Base price}}$.44	.44	.38	.28	.38	.45	.33	.28	.32	.23
Base price	Cents/half gallon	39.771	39.138	44.953	44.949	50.595	51.222	52.948	59.037	70.002	70.718
Price increase per 100 miles	Cents	.9449	1.0202	.8068	.7642	.8420	.9038	.7495	.7556	.9634	.9420
SELECTED MARKETS (INCLUDES ABOVE FEDERAL ORDER MARKETS)											
Number of markets		97	104	117	132	130	129	131	87	96	103
Correlation $\frac{1}{\text{Base price}}$.42	.43	.37	.28	.39	.46	.35	.24	.32	.26
Base price	Cents/half gallon	40.046	39.302	45.231	47.327	50.761	51.254	52.939	59.849	70.196	70.704
Price increase per 100 miles	Cents	.9077	1.0019	.8508	.7780	.8404	.9130	.7727	.6689	.9448	.981

$\frac{1}{\text{Base price}}$ Correlation is the percent of price differences explained by (associated with) distance, with 1.00 representing 100 percent or complete explanation and 0 representing no explanation.

Table 5--Retail milk prices in markets east of the Rocky Mountains related to dealers' pay price for milk for fluid use, selected years 1960-75

Item	Unit	1960	1965	1967	1968	1970	1971	1972	1973	1974	1975
FEDERAL ORDER MARKETS											
Number of markets		88	95	89	105	108	108	106	82	81	86
Correlation ^{1/}		.58	.56	.41	.26	.36	.40	.32	.28	.34	.28
Base price	Cents/half gallon	21.250	18.639	20.117	23.558	21.724	18.770	21.999	26.220	27.520	26.344
Price increase per \$1 pay price	Cents	4.8378	5.4349	5.0759	4.5519	5.1455	5.5895	5.1260	4.1114	5.0374	5.2312
SELECTED MARKETS (INCLUDES ABOVE FEDERAL ORDER MARKETS)											
Number of markets		96	104	117	132	131	128	127	101	101	104
Correlation ^{1/}		.61	.56	.47	.26	.40	.42	.30	.29	.30	.30
Base price	Cents/half gallon	21.800	19.153	16.974	23.013	23.013	18.269	23.485	26.891	37.054	27.918
Price increase per \$1 pay price	Cents	4.7298	5.3313	5.6771	4.7289	5.4108	5.6889	4.9402	4.6535	4.1071	5.1057

^{1/} Correlation is the percent of price differences explained by (associated with) distance, with 1.00 representing 100 percent or complete explanation and 0 representing no explanation.